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Priest, St. John
A letter to the
members of the Norfolk
Agricultural Society

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A L E T T E R
TO THE
MEMBERS
OF THE
NORFOLK AGRICULTURAL SOCIETY,
UPON
FEEDING
HORSES & COWS,
WITH
OBSERVATIONS
UPON
CARRIAGES OF BURDEN,
BY
THE REV. ST. JOHN PRIEST,
SECRETARY TO THE SOCIETY.



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TO THE
MEMBERS
OF THE

NORFOLK AGRICULTURAL SOCIETY.

GENTLEMEN,

IN the situation in which I stand in your society, I have had many letters to read to you, which I have received, and many which I myself have written; amongst the former, I must think I have had some highly creditable to the writers,* and honourable to ourselves, but of all we have to boast, none have excited my attention more than those, which I have received from a gentleman in Cumberland; a man of the first rate abilities, and what sets those abilities in the highest point of view in my mind, a Commoner of the first rank, as to fortune, and yet exerting his talents in the advancement of the Agriculture of the Country—I mean JOHN CHRISTIAN CURWEN, Esq. one of the Members of Parliament for Carlisle. By the introduction of our most friendly and most excellent President, I became acquainted with Mr. Curwen in the middle of this summer at Holkham, and immediately upon his arrival at home, at Windermere, in Westmoreland, and at Workington in Cumberland, a correspondence commenced between us. It would take up too much of your time for me to recapitulate all which has passed in our letters, but it would be unpardonable in me were I to withhold, what appears to me of so much importance to the interest of those concerned in Agriculture, those subjects, which have formed the topics of our correspondence, and, as practised by Mr. Curwen, have so far excited my astonishment, as to induce me, upon the instigation of our President, to take a journey from hence to Workington, in order to be an eye witness to facts, which before I had only seen on paper.

It is not, gentlemen, in what I have to relate to you, that I expect I am to improve your Norfolk mode of farming; this would imply much arrogance in myself, and be by no means complimentary to you. Norfolk farming (if I may be allowed to express my sentiments upon it) has arrived at a pitch of excellence, far beyond that of any other county which I have seen; but high as it is, I presume no Norfolk farmer would take upon himself to say, it is impossible for it to advance higher. There is no doubt but exalted as it is, the work is not complete; it will require time to per-

* Witness Mr. Repton's Letter upon preserving Turnips; Mr. Burrow's upon Lucerne; Mr. Salter's upon dibbling Pulse upon Meadows; and Mr. Kent's upon Leases.

fect it. Every one knows, that it is more difficult to complete the end of every work, than either to lay the foundation, or to raise the superstructure: let the Norfolk farmer himself be asked, what part of his enormous barley-stack requires most time in its construction, and the nicest art in the completion, and he will answer you, the summit: So it is in Norfolk farming; there is so much system exercised, so much art employed, and such a superstructure already raised upon the best of foundations, that to complete the work, much time, much of nice discrimination, is necessary, and no rude hand can execute the task. What then I have to advance, I hope will be taken as it is intended; viz. to lay before you what I have seen so uncommon in farming, but yet, in my estimation, of so much importance at the present extraordinary period of time—a period when we know our population is encreasing, and, as some think, faster* than the means of subsistence—when we are threatened with exclusion from foreign ports to provide sustenance for that increase, and when, of course, imperious necessity will oblige us to find (what many persons well versed in rural economy think may be found) within ourselves, the resources sufficient to maintain any degree of population, to which we may arrive.

Premising thus much, I am now to inform you, that in Mr. Curwen's statement to me, I was beyond measure astonished at the enormous crops of clover, which seemed to be produced upon his farm at Workington, crops to the amount of 35 and 36 tons weight, and much delighted with the artificial resources, by which he maintains the great number of horses, which he is obliged to keep upon only 500 acres of land. For surely, gentlemen, 140 horses must, with the utmost economy, require a large tract of land to supply them with food; and such is the number Mr. C. must keep in order to work his collieries, which are larger than any individual in this united empire can boast he possesses. I think I may state fairly, that the whole farm would but be barely sufficient to maintain his horses, were it not for the artificial method of feeding, which he has adopted. For he has found that 40 acres will supply food by his method of feeding, when, by the general method, 280 acres would be required; add to this, that besides the horses already mentioned, Mr. Curwen maintains, constantly, between 20 and 30 cows, in order to supply the town of Workington with milk, and (I will also hope to hear, after what he has seen at Holkham†) he keeps, at least, 100 breeding ewes. You will not then be surprised, that I should readily accept a pressing invitation from Mr. Curwen, backed by a most powerful encouragement from our President to go and see, what I could not but esteem, "*wonders in agriculture.*" I left home Sunday, the 27th of September, arrived at Workington, in Cumberland, on Thursday, the 1st of October, and reached home again on Friday, the 9th, having been absent 12 days, travelled 800 miles, and remained at Workington four days.—Cumberland, gentlemen, is a country by no means propitious to farming, and undoubtedly, a man with only half an agricultural eye, though he may be lost in astonishment at the wonders of nature, which he there sees, for it is the most mountainous country, and Skiddaw and Saddleback, the highest mountains in England, he cannot, I say, be so far lost in rapture with romantic scenery, as to forget, that unless there be some utility, something really serviceable to man, all scenery, all the pleasures of the eye and imagination must be vain; and under such contemplation, who that knows the value of land, and how much may be done even in the *highly* cultivated field, how much not only the farmer, but the proprietor and the public may be benefited, who, I say, with sentiments such as these, can view the enormous, the immense tracts of land, which form the mountains under contemplation without seeing and feeling, that agriculture here lies

* See Malthus on Population.

† Mr. Curwen allows Mr. Coke and the farmers of Norfolk to be unrivalled in the management of sheep.

dormant; that what now affords scarce provision for a few vile sheep,* without form, without coats of any value, might, by a small effort, be metamorphosed into rich pastures, abounding with as useful sheep as any in the island. I say a small effort, for nothing more is wanting but at proper points to draw out the water by boring, which now poisons large tracts of land, and to introduce it upon the surface by the method, which irrigators call catch-work, and in many parts by introducing Salter's method of dibbling pulse. But this is not all which renders Cumberland distressing to a farmer: enormous rents, from two to four pounds per acre, with servants' wages and labour out of all bounds, and a climate† where there is perpetual rain, can never gladden the farmer's heart, or enable him to carry on business systematically. The consequence is, there are no farmers: there are men who rent each a small portion of land, living in hovels, and employing a few women in the field, and with a few potatoes to add to their oat cake and make themselves a meal, lingering a life of slavery, but no farmers.‡ I could not but contrast this state of things with what I had left in Norfolk, and would have exclaimed in rapture upon you Norfolk farmers, what often used to escape my boyish lips,

O fortunatos nimium, sua si bona norint,

Agricolae § ———

were I not sufficiently acquainted with you to say, it is not perfectly applicable to you at the present day,|| because you not only are sensible of your *advantages*, but you have the gratitude, the generosity to acknowledge the cause. You know and fear not to reverence your patron, whose name, gentlemen, has reached Skiddaw's tops, and is as well known on all its sides, and as much revered as in Norfolk itself.

After this representation of the state of agriculture in Cumberland, is it possible I should be able to state any practises there used,¶ which can prove advantageous to you? I know not. You will be the best judges when you have heard them, and famed as you are for system, let not economy be overlooked by you: let *artificial* farming claim your attention. You see, what it will do in watering meadows.—You find there an early and double spring-produce, a treble summer, and an aftermath equal, if not su-

* These sheep properly selected, and put to Southdown tups judiciously chosen, would produce a very valuable cross of sheep.

† During my stay it rained perpetually, and much corn was green in the field.

‡ I speak comparatively and with reference to the Norfolk farmers particularly.

§ In English—Farmers happy beyond expression, if they did but know their advantages.

|| Forty years ago the rent roll of the first estate in this county, I believe, did not amount to more than £4000 a year, and the tenants, except one or two, were all poor, and little better than boors; at the present day, the rent roll is nearer to 40,000l. and the tenants are all rich, the best farmers in the island, and form part of a most respectable yeomanry with an urbanity of manners highly creditable.

¶ Notwithstanding this state of the agriculture of Cumberland in general, the practice upon Mr. Curwen's farm is really good, and his crops abundant. He ploughs deep, has a great quantity of the best manure at command, viz. Soaper's waste from Dublin, the ashes of his collieries, and the scrapings of the town of Workington, and follows the four years course of cropping, viz. a green crop and a corn crop alternately. His green crops are in drills at large intervals, for the sake of ploughing between them, except the clover and some colewort crops, and his wheat is drilled at nine inches. I shall take an opportunity of shewing you the advantage of this mode of tillage in the turnip crop at a future time—in the mean time I beg to state, that turnip crops drilled upon manure laid in rows, at three feet intervals, will produce to the amount of between forty and fifty tons per acre.

I shall think myself obliged to any farmer who will allow me to weigh eleven yards square of any green crop he has.

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perior, to any the best pastures: and, allowing the expense to be what it may, state it if you please three rents, and let the produce only equal the outgoings, mark the advantages: a certainty of food for cattle, at a time when other men's stock is pining with want and almost famishing, and the necessary consequence, a power of keeping perhaps double* the stock which the farm would otherwise carry, and withal a dunghill, the value of which is incalculable. This you will allow is artificial farming highly meritorious; that art, which I am now to explain to you, is of a different kind, it is not the art of making land produce more, but it is the art of husbanding land well, it is the art of Economy. I have already stated to you in general terms, that Mr. Curwen's whole farm would but just maintain his horses in the common method of keeping them, and that he says himself forty acres in the way he now uses will go as far as two hundred and eighty used to do; nay that previous to his adopting the present plan "he sunk the rent of his farm (£1000) and £700 besides:" but general assertions alone are not sufficient to induce a wise farmer to risk capital and practice upon innovations. I must reduce my observations to an arithmetical calculation, and be as concise and clear as I can. I will therefore briefly state Mr. Curwen's plan, and then proceed to the calculation, and shew what would be the expense and profit of pursuing the same in some instances here.

Mr. Curwen feeds all his horses, by day, upon *steamed potatoes*, with *cut straw* and *bruised oats* mixed with them, and with *uncut straw* by night. To each horse he gives $2\frac{1}{2}$ stones of steamed potatoes, a sixth part of cut straw and 8lbs of oats, and by night 6 lbs. of uncut straw, and no hay or food of any other sort whatsoever, except to his horses underground, which have hay† instead of straw by night. If now it shall appear that 20 horses thus fed in Norfolk would leave to the farmer a quantity of land to be applied to other purposes, and even if the profit thence arising does but pay the expence of having recourse to this mode of feeding, mark what is done—Land before employed in the feeding and maintaining horses is rescued to the use of man either to feed cows, oxen, and sheep, or to produce what may be consumed as food by man: in which case the public receives an incalculable benefit, and provision is made for an increased population. This will, however, require such a diffusion of philanthropy and patriotism perhaps as is not to be expected, unless private advantage accompanies the process. Let us, then, examine the advantage to the farmer by feeding twenty horses in this manner.

Each horse has $2\frac{1}{2}$ stones‡ of potatoes; then 20 horses require 50 stones per day: of cut straw each horse has ten pounds; 20 horses then require 200 lb. *i. e.* $14\frac{2}{3}$ stones per day—say 14 bushels struck: this will require (to speak in popular language) about 4 bunches of straw. Each horse has 8lb. of uncut straw; then 20 horses require 160 lb. *i. e.* $11\frac{2}{3}$ stones—say 3 bunches. Each horse has 6 or 8 lb. of oats; therefore 20 horses require 120 or 160 lb. of oats, *i. e.* about 1 bushel of oats each horse, or 5 coombs per week for 20 horses.

* Undoubtedly this will depend upon the proportion of water meadows to the arable land.

† Mr. Curwen means to alter this allowance of hay to the horses in the collieries.

‡ The stone is 14 lbs. the cwt. is 8 stones, or 112 lbs. The bushel is the Winchester, the coomb is 4 Winchesters, a sack of potatoes is 3 Winchesters heaped, and the chaldron is 36 bushels heaped. It is necessary to make these observations, for nothing creates more confusion than the difference of weights and measures in different parts of the kingdom, and particularly between Cumberland and Norfolk; a bushel there generally means 3 Winchesters, a coomb is not heard of, and a bushel of potatoes means a bushel struck.

Twenty horses, then, require from September 1st to May 31st* (273 days) 13,650 stones of potatoes: now land proper for potatoes will produce 100 sacks per acre, weighing 14 stones per sack: therefore 20 horses require nearly 10 acres of potatoes; of straw, say about 7 or 8 bunches every day, and but little more will be consumed than is necessary for them to lie upon: substitute then sand, silth, or fine mould, and only the expense of fetching need be considered. Suppose the land to produce 15 coombs per acre of oats, 20 horses require $17\frac{1}{3}$ acres for the year: but whether potatoes or hay be used, the oats consumed will remain the same, viz. 1 bushel per week each horse, and therefore in the comparative estimate we may leave out the corn entirely: though it is to be observed, that Mr. Curwen bruises his oats, and mixes them with the potatoes and cut straw, and thus they afford (undoubtedly to *old* horses) more nourishment.

Having thus considered the quantity of land necessary to grow potatoes for 20 horses, let us next ask how many acres of land are required by the common method to produce feed (*i. e.* grass and hay) for 20 horses, for the same time. This certainly will vary with the quality of the land; if the land is such as is proper for potatoes, I conceive we may state it to be not less than $2\frac{1}{2}$ acres to a horse, *i. e.* for 20 horses 50 acres, from September 1st to May 31st. The potatoes, however, require only 10 acres; by deducting then 10 acres necessary for potatoes from 50 acres necessary for grass and hay, there will remain 40 acres of land rescued from the jaws of the *Horse* to be applied to whatever advantage the farmer pleases for the maintenance of *Man*: And if these 40 acres will not pay him more than the extraordinary expenses of feeding with potatoes (which must now be estimated) it can scarcely be expected he should adopt such a plan. It remains for me to state those expenses and for him to find out the profit.

If the potatoes are grown as they ought to be upon a fallow, *i. e.* a preparation for a corn crop, I can set down nothing for tillage, because a crop of turnips would cost as much, and be no better preparation for the succeeding crop of oats, or whatever the farmer may choose to sow: for although more manure may be required for the potatoes than for turnips, yet the extraordinary quantity made by feeding the horses with them in stalls will amply compensate for this excess. For taking up the potatoes 3d. per sack must be allowed. For coals 1 bushel per day must be charged, which may be computed at 2 guineas per chaldron, exclusive of carriage. For the capital I shall set down Mr. Curwen's own statement, viz. 40 guineas, and allow besides for attendance and the wear and tear of utensils†—thus

Taking up ten acres of potatoes, 100 sacks, at 3d. per sack	-	-	-	£12	10	0
The interest of 40 guineas, the price of the utensils‡ for steaming	-	-	-	2	2	0
Coals, 273 days, at 1 bushel per day, call these 8 chaldrons,§ at 2 guineas per chaldron, 16l. 16s. and 3s. 6d. per load carriage, 10s. 6d.	-	-	-	17	6	6
Attendance, one man for 273 days, at 1s. 8d. per day	-	-	-	22	15	0
Wear and tear of utensils	-	-	-	0	10	0
				<hr/>		
				£55 3 6		

* Potatoes can scarce be fit for use before September nor after May.

† I omit the *setting* the potatoes and the *stacking* them, because in the common method of feeding horses, there would be the *mowing*, and *making*, and *stacking* the hay grown upon the land allowed for them, to be set against these expenses. I also omit the expense of *cutting straw*, because this would I presume be incurred by the common method of feeding.

‡ For a description of these see the transactions of the Society of Arts, &c. Vol. 21, pages 203 and 209. A copy of which shall be printed for our Society, if necessary.

§ I say nothing about the carriage of coals. It is strange if a farmer, who keeps 20 horses, should not be able to add this to the work of his farm, without charging more than what really he must pay immediately out of his pocket. If,

Add 4l. 16s. 6d. for sundries, to compensate for errors, and call the extraordinary expenses incurred by feeding 20 horses upon potatoes instead of grass and hay, 60l. from September 1st, to May 31st, and to defray these expenses, the farmer receives the produce of forty acres of land. Shall I state the value of this produce to be five times 40l. or only four times that sum, or shall I leave the farmer to reflect how he can apply the produce of these remaining 40 acres, so as amply to remunerate him for his trouble and economy? I leave the farmer also to determine how he may feed his horses during the months of June, July, and August, in the cheapest and best manner possible, and to the best advantage. Were I asked how this should be, I would answer upon lucerne, clover cut green, or any green food* and carrots,† and in the yard for the sake of the manure and for the sake of comfort. Who can view without horror the immense consumption of grass and the annoyance which horses cause, when left to range over rich pastures at their pleasure, consuming the food of animals useful to the maintenance of man, and as soon as full, destroying more than twice as much as they have devoured, and perhaps breaking fences, and running over and beating down fields of standing corn, either belonging to the farmer himself, or, what is worse, his neighbour, and thus destroying not only the food of man, but the peace and quiet of the neighbourhood, without any benefit whatever to the farmer, and with loss of rest‡ equally as necessary as food to themselves?

II.—You will of course naturally enquire what use Mr. Curwen makes of his chaff and coulder. He never gives this to his horses, but with the waste of corn, and the broken straw in the barn from thrashing, he does not

————— “*After burn the straw,*”

but *boil* it, actually *boil* it, mixing with it oil cake: thus, for every cow, two stones of *boiled* straw, chaff, and coulder, with two pounds of oil cake per day, and besides this *boiled stuff*, (a sample of which I shall have the honour to shew you at our next meeting) Mr. Curwen gives each cow 4 lbs. of green food, as lucerne, clover, turnips, coleworts, or cabbages. The cows are fastened by the head to fixed wooden yokes in stalls, and stand so elevated, that their dung falls from them below their bed. Here they are kept day and night, and fed alternately with the boiled ingredients, and 1 lb. of green

however, he cannot afford to make himself a present of this carriage, if he has calculated the work of his horses so nicely, that he cannot allow them to be thus *idly* employed for three days, then let the additional 4l. 16s. 6d. which I have given to compensate for errors, pay the carriage.

* The advantage of green food above dry, *i. e.* the profit of using food green above using the same in a dry state, may partly be ascertained from the excess of weight in its green above that in its dry state. The Bishop of Llandaff has ascertained the following diminution in weight to take place in lucerne, clover, and rye-grass.

1200 grains of lucerne in its green state are reduced to 250 in its dry state as hay, *i. e.* nearly from five to one, to speak in round numbers.

1272 grains of clover to 324, *i. e.* nearly from 4½ to one.

1272 grains of rye-grass to 406, *i. e.* nearly from three to one.

Hence a rod of lucerne which might produce in three cuttings 4½ cwt. green, and afford food for nine horses for a day, will be reduced to less than 1 cwt. when made into hay, and not afford food sufficient for two horses for the same time.

† We shall soon see the advantages of this crop for feeding horses stated: for if no other person does it, I shall undertake it myself upon the *data*, which I have received from Mr. Curwen, and what I saw at Workington, together with what I have also seen upon Mr. Burrows's farm at Witchingham, near Reepham. Land proper for carrots will produce 15½ tons per acre.

‡ Mr. Curwen finds great benefit in this respect to his horses by feeding upon potatoes. They very soon fill themselves, and immediately fall to rest. They appeared very healthy and in excellent working order when I saw them.

food. The cows appeared all healthy, they were of different breeds, Devon, Suffolk, and Cumberland. Mr. Curwen keeps between 20 and 30, and sells all their milk at 1d. per quart, wine measure. This, it is true, is a local advantage, but the lesson to be learned is general and serious; viz. attention to the consumption of food* by weighing to every animal, what it requires for its support. It was from this circumstance my astonishment was excited at the quantity of clover, which Mr. Curwen cuts per acre. He begins to mow his clover in the first week of June for his horses, giving the first cutting of lucerne to his cows, and by weighing ten yards square† of each cutting, he knows exactly what his produce is per acre, and what quantity his stock consumes per day. In my presence he weighed (Oct. 3d, 1807) a third cutting of clover by marking out ten yards square, the clover cut from which, was weighed immediately, and amounted to 21 stones. It was about two o'clock. Mr. Curwen was therefore cutting clover, which yielded 6 tons, 7 cwt. $5\frac{1}{2}$ lbs. per acre. He had at the first cutting in June got 36 stones upon 10 yards square, *i. e.* 10 tons, 17 cwt. $6\frac{2}{3}$ stones, per acre, and at the second cutting, viz. in the middle of July, 31 stones upon 10 yards square, *i. e.* 9 tons, 7 cwt. $4\frac{2}{3}$ stones per acre: whence he has got by the three cuttings this year, 26 tons, 12 cwt. 3 stones, $2\frac{1}{2}$ lbs. an immense produce to those who never saw clover weighed in its green state, but by no means equal to some crops growing in this county.

On the same day, when we weighed the third cutting of clover we also weighed the first cutting of a crop of colewort, called by some cole seed or rape, sown broad cast, and just begun for soiling cows; its produce was 42 stones upon ten yards square, *i. e.* 12 tons, 14 cwt. $11\frac{1}{2}$ lbs. per acre.

By thus weighing the green crops we discover that by mowing clover first in June, a second time in the middle of July, and a third time in October, more produce is reaped per acre than by the common method pursued: besides which by feeding in stalls the quantity of muck is much increased, and the animals are generally in better plight.

The following is Mr. Curwen's estimate‡ of feeding his cows per day:—

2 stones of green food	-	-	-	0
2 stones of boiled chaff, &c.	-	-	-	2
2 lbs. of oil cake	-	-	-	2
8 lbs. of straw	-	-	-	1
				<hr/>
				5

* A wise man, who makes this a point necessary in farming, will not esteem him the best grazier who brings the finest and the fattest animals to market, but him who brings the most of marketable meat, produced from the least quantity of food consumed. It is attention to this circumstance, which must enrich the farmer and the public. The means of doing this once ascertained, it will no longer be a question of dispute whether the Southdown or the Norfolk sheep is to be preferred; or of neat beasts, whether the Keyloe or the Galloway, the long-horned or the short-horned.—Some farmers in the North are at this time very attentive to these questions, and I doubt not but ere long we shall see some very meritorious experiments published.

† It would be better to take 11 yards square, which is exactly 1-40th part of an acre, thus 11 yards is $\frac{1}{2}$ a chain, therefore 11 yards square is $\frac{1}{4}$ of a chain square, and a chain square is 1-10th of an acre, therefore 11 yards square is $\frac{1}{4}$ of 1-10th or 1-40th of an acre, or in other words 11 yards square = 121 square yards, and $40 \times 121 = 4840$ square yards = an acre.

‡ It may be objected to this statement of estimate, that a value is set upon the green food, &c. previous to the use intended by the farmer: whereas the value of the food ought to be estimated by the use made of it by the farmer.

Whatever

	£.	s.	d.
Two hundred days* keep of one cow	4	11	8
Attendance	2	0	0
Loss in resale†	2	0	0
	<hr/>		
	£	8	11 8
Return 6 quarts of milk per day, at 2d. per quart, for 200 days	10	0	0
Calf†	2	0	0
Twenty carts of manure	1	10	0
	<hr/>		
	£	13	10 0
	<hr/>		
Profit	£	4	18 4

Whence the profit of a cow for a year is 8l. 19s. 5d. or 9l.

The most important consideration in this estimate is the small quantity of land required, and the use, which the kind of food here used is put to. The same quantity and quality of food could not produce so much profit by grazing. Mr. Curwen grinds the oil cake, and boils it with the chaff, &c. and finds that three acres of green food is sufficient for 30 cows, 200 days, giving to each 2 stones per day. By this mode of feeding, Mr. Curwen sold last year

66912 quarts of milk for	-	-	£. s.	557	12	from 25 cows, or 72 quarts per cow
The expense of feeding them was				329	0	

The profit £.228 12

Now let us ask how many acres of green food are necessary for 30 cows 200 days, by the common method of feeding. Will not each cow require $\frac{1}{2}$ of an acre of turnips from October to April, besides straw? If so, 30 cows require $22\frac{1}{2}$ acres of land for less than 200 days. By Mr. Curwen's method of feeding then $19\frac{1}{2}$, nay, we may fairly say, 20 acres of land are saved for stock of a different kind, or for such purposes as the farmer thinks proper to put them to.

In what way this method of feeding cows may be improved for Norfolk farmers requires experiment and fact to shew—Mr. Curwen has great merit in practising it to the extent he does. It is only wonderful he does not appropriate the savings, which are so manifest upon his farm, to the support of breeding ewes. I must not, however, indulge either a splenetic or a conceited temper—I went into Cumberland not to be peevish and fretful at what I did *not* find, but to admire what was beautiful, and to select what was serviceable—and I think after the means of using economically the food of horses, I saw the means of lessening their number.

Whatever can be carried to market will have a value set upon it by that market, but what cannot be carried to market can be valued only by that which can be carried to market in its stead. For instance, if I grow a crop of carrots and can get no market for them, they are of no value to me, unless I feed animals with them and carry those animals to market, or horses, and carry to market the corn or hay, &c. which those horses must have consumed instead of the carrots.

* i. e. From October to April, when chaff and coulder and broken straw can be supplied them.

† Mr. Curwen sells his cows as they become old or unproductive, and all his calves, and buys young cows.

III.—Every person, who travels in the north of this empire, knows that he is continually meeting one-horse carts, and indeed seldom any other kind of heavy carriage. It is no uncommon sight to meet nine, or more of these carts following each other, and driven by only three persons, perhaps two of them women, or perhaps one woman and two girls, and for myself, I could not view such a sight without examining the cause, and ask myself whether it is better to drive as we do in Norfolk, a heavy waggon by four horses, or three or four of these carts. In this instance, my dynamometer* served me well. For I discovered, what is almost incredible, that one of these carts,† loaded with stones to the amount of 1 ton, 1 cwt. 4 stones, 7 lbs. was not more laborious to a horse, upon level ground, than one of our waggons without any load at all. For its bearing upon the horse's back, *i. e.* the weight of the shafts was in that state only $7\frac{1}{2}$ stones, *i. e.* wanting $\frac{3}{4}$ of a stone of a cwt. and the power necessary to draw it, which I will call the power of draught, only 2 cwt. 1 stone. These facts were accurately ascertained, and the load of stones carefully weighed in 11 parcels, thus:—

	Stones.		Stones.
The 1st parcel weighed	15 $\frac{1}{2}$	Brought forward	101
2d	16 $\frac{1}{2}$	The 7th parcel weighed	15
3d	21	8th	18
4th	15	9th	17 $\frac{1}{2}$
5th	16	10th	18
6th	17	11th	11
	<hr/>		<hr/>
Carry over	101		172 $\frac{1}{2}$ = 1 1 4 7
			<hr/>

One horse could draw the above upon level ground with ease, and to any distance whatever; no more than two horses are at any time required.

Now a waggon, which I had previously examined at West Lexham, required 2 cwt. 5 stones, to draw it upon level ground without any load at all. Thus the cart loaded with more than a ton weight, was not so much toil to a horse as the waggon at West Lexham without any load. But it is not from a single instance of trial that I would draw any conclusion, and particularly an instance such as this, which I am free to own contradicts the doctrine of an excellent experimental philosopher, Desaguliers, who read lectures first at London, and afterwards at Oxford. This philosopher has given M. De Camus' experiments and instances to shew that, under any circumstances, a carriage upon four wheels, requires less power to draw it and to overcome obstacles, than a cart with two wheels under the same circumstances. I deny, positively, this fact in practice. This is strong and bold language, but such as I am bound to hold, and in which I shall be supported by those persons, who were witnesses to my experiments, two of whom I shall mention, J. C. Curwen, Esq. and Mr. E. Beck, the former of whom saw me use my dynamometer, at Workington, in Cumberland, and the latter saw me use the same dynamometer at West Lexham, in this county. It is in vain to say the instrument erred, because whatever might be its error, it was the same in both places, and of course the relative powers of draught were the same, however, the positive draught might in both places be wrong from an error in the graduation.

* This was made by the Rev. W. A. Barker, at my express request, and received the premium for the best implement shewn at Holkham, in the year 1806. It is the invention of M. Regnier, a Frenchman.

† See a delineation of one in page 11th.

I do not say that all waggons require so great a power of draught as that at Lexham, because I have tried some that require no more than 1 cwt. of power, but I may add, that many require more. My own waggon, without any load, requires a power of 3 cwt. 5 stones to draw it, and the weight of the shafts is 6 stones.

The weight of the above cart was 14 cwt. 18 lbs. the weight of the waggon at Lexham, I presume, is 24 cwt.

Such carts as the above are most commonly driven with two horses at Workington; but let us attend to other facts, which relate to one-horse carts only.

I made the following experiments upon a Cumberland one-horse cart.

Its weight was 7 cwt. 7 stones, and the weight of its shafts 2 stones. The power of draught 2 stones.

Loaded with 20 stones its power of draught was on the first trial, 3 stones, on the second 3 stones, and on the third, $3\frac{1}{2}$ stones.

Loaded with 40 stones its power of draught was on the first trial, $4\frac{1}{2}$ stones, on the second $4\frac{1}{2}$ stones, and on the third, $4\frac{1}{2}$ stones.

Loaded with 60 stones its power of draught was on the first trial, $5\frac{1}{2}$ stones, on the second $5\frac{1}{2}$ stones, and on the third $5\frac{1}{2}$ stones.

The draught became more steady as the weight was increased. The third trial was made upon the same ground back again.

Compare with the above a trial upon a waggon at Gressenhall, one of the lightest of draught for its size I have ever seen.

Its weight was 22 cwt. the weight of the shafts 5 stones, the power of draught 1 cwt. 1 stone.

Loaded with 20 stones its power of draught was 1 cwt. $2\frac{3}{4}$ stones.

Loaded with 40 stones its power of draught was 1 cwt. 4 stones.

Powers very different from those of the cart carrying the same weights.

Now upon such carts as the above the common load of coals is 5 Carlisle bushels, that is, 15 Winchester; whence four carts with four horses, *i. e.* one horse in each cart, will carry 60 bushels to any distance; but upon such a waggon as the above, not more than $1\frac{1}{2}$ chaldron, that is, 54 bushels of coals are carried, 6 bushels less than upon the carts, and evidently with more labour to the horses, for in the carts, each horse has only 2 stones of unprofitable draught, whilst in the waggon each horse has more than 2 stones.

It is not uncommon in Norfolk to see a waggon with three horses carrying only 1 chaldron of coals, *i. e.* 36 bushels, but three horses, in three Cumberland carts, carry 45 bushels, and with only one driver.

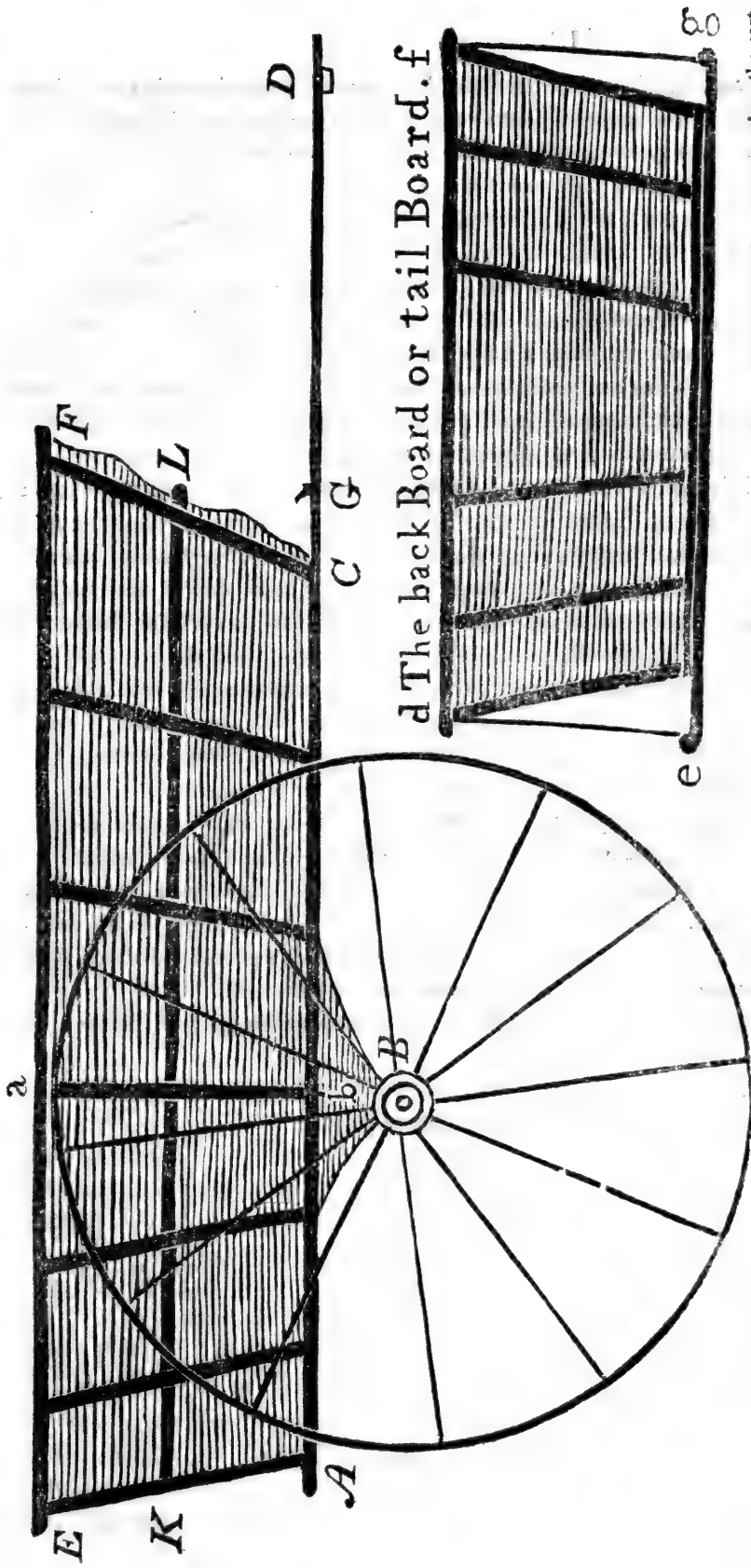
Such carts as the above carry 10 Carlisle bushels of wheat to any distance, *i. e.* 30 Winchester; hence three such carts, with one driver, carry 90 bushels. Now a Norfolk waggon, with four horses, carries generally no more than 20 coombs of wheat, *i. e.* 80 bushels. Three horses then do more work in the Cumberland carts in carrying wheat, than four horses do in the Norfolk waggon.

Of oats the above carts carry 12 Carlisle bushels, *i. e.* 36 Winchester; hence four of them carry 144 bushels. But a Norfolk waggon, with four horses, seldom carries more than 30 coombs, *i. e.* 120 bushels.

And the same disparity exists in all instances of carriage.

There is therefore a manifest excess or loss of labour in horses in the use of our large waggons instead of one-horse carts employed in the carriage of heavy burdens, where slow work is required. Three carts with three horses, we have seen above in the carriage of wheat to market, will do more work than four horses in one of our waggons, and with only one driver; and as to the first cost, the three carts may be bought for 36 guineas, and who can build a Norfolk waggon for so little money?

THE CUMBERLAND CART.



d The back Board or tail Board. f

d e and f g are rods of iron, and the same are also fixed in the front to strengthen the cart. axle between the naves 3 ft. 5 inc.; and from the shoulder to the points 1 ft. 1 inc. —The width of the shafts at the bar G 3 ft. 4½ inc.; ditto at the centre 3 ft. 3½ inc.; ditto at the bearing point 2 ft. 7 inc.

The dimensions of a One-horse Cart are these:

The length of the cart from A to C, is 5 ft.; and the length of the top from E, to F, about 2 inc. more.—The width at the points K and L, within it is 3 ft. 4 inc.; at the top E and F, it is a little more, and at the bottom A and C a little less.—The depth at the ends, i. e. from E to A, and from F to C, is 15 inches; and in the middle, i. e. from a to b, 14½ inc.—From the tail A to the point b above the axle is 2 ft. and from the point b to the front C, is 3 ft.—The length of the bearing point D to the front of the cart C, i. e. D C, is 2 ft. 9 inc.; hence from D to b, is 5 ft. 9 inc.—The diameter of the wheel is 4 ft. and the cart is raised above the axle 6 inc.—Some persons have the wheels made less in order to accommodate them to the height of the horse in descending the hills.—The wheels have twelve spokes, and the rim of the wheel is 6 inc.

The dimensions of Mr. Curwen's Two-horse Cart, called a Double Cart, are these:

	Cat.	qrs.	lbs.
The weight of the two wheels	-	7	0
Do. body	-	7	0
Total weight	-	14	0

The inside dimensions: the width at the bottom, at A and C, 3 ft. 8 inc.; ditto at the top, at E and F, 4 ft. 1 inc. The length of the bottom, from A to C, 5 ft.; ditto of the top, from E to F, 5 ft. 2 inc.—The length of the nave 1 ft. 1 inc.; the diameter of the nave 1 ft. 4 inc. The height of the wheel 4 ft. 7 inc.; the breadth of the rim 6 inc.—One streak or tire of iron on the outside and one hoop on the inside one inch thick. Twelve spokes. From the centre of the axle to the hindmost corner, i. e. from b to A, 2 ft. 3½ inc.; ditto to the foremost corner, i. e. from b to C, 3 ft. 1½ inc.—The length of the shaft from the bearing point to the bar before, i. e. from D to G, 6 ft.; ditto from the bar before to the bolt, i. e. from G to C, 2 ft. 1½ inc.—The length of the

Thus then have I represented to you, gentlemen, what I could not see without admiration, nor deny myself the pleasure of communicating to you without great violation to my feelings, considering the honourable situation in which I stand amongst you, and what I think I have clearly pointed out to you, viz. a practical plan in the feeding of horses and cows, so as to derive great advantage to yourselves and benefit to the public. These are not the ideal reveries of a man intoxicated with conjectural agriculture, nor the precepts of a *book-learned* farmer, but deductions drawn from the useful economical practice of a man, who has pursued from necessity, (the best of teachers) those means of supporting a great number of horses and cows, which otherwise could not have been kept upon the farm he occupies. The consequence would have been, his collieries could not have been worked without an enormous outgoing expense, nor the inhabitants of Workington (consisting of 8000 persons) been supplied with one quarter of the milk necessary. And as to the comparison of carts and waggons, it is past contradiction, that in this county we are using a heavy, cumbersome, expensive, tumbril and waggon, requiring one-horse at least to drag each unloaded, and by that means increasing the number of horses to be kept, whilst in the county of Cumberland, the agriculture of which it would be an affront to you to put in competition with your own, (as you may well believe after what I have stated of it in general) a neat, light, strong one-horse cart, capable of carrying manure, lime, marl, coals, corn, &c. is used for any weight and for any distance, to the advantage and benefit of the farmer and the ease of the horse. I speak not of quick carriage; I know perfectly well the activity with which our harvest is got in, but surely a light neat Berkshire waggon, or a waggon formed by joining two Cumberland carts together, (which might very easily be done) would be better for the purpose than that now in use, and be far less expensive. I might go much farther in my observations upon these statements, and shew how much is lost to the kingdom at large, by the present general plan of managing and feeding horses, and increasing their number beyond what is absolutely necessary:* but such statements are more proper for the statesman; the farmer will learn but little from them, and I think I have neither suppressed, what is for his interest to know, nor in any wise over-rated the advantages to be gained by him in his individual capacity by the simple methods I have used. Indeed I am convinced, that whatever may be his sentiments upon the particulars I have stated, every farmer will conclude with me in general, that economy in the management of the food of horses and stock,† is an art necessary to be learnt.

I conclude by proposing premiums for the reduction of the food of horses and stock, and for improving carriages of burden, and have the honour to remain,

GENTLEMEN,

Your obedient Servant,

Scarning, November 1st, 1807.

SECRETARY.

* It is almost incredible, what the number of acres absolutely necessary is. The horses necessary for two mail coaches up and down from London, to a place 108 miles distant, require 730 acres of oats, allowing each acre to produce 12½ coombs, and allowing to each horse $\frac{1}{2}$ a bushel per day.

† Quere.—May not all kinds of stock, even grazing stock, eat more food than is necessary?

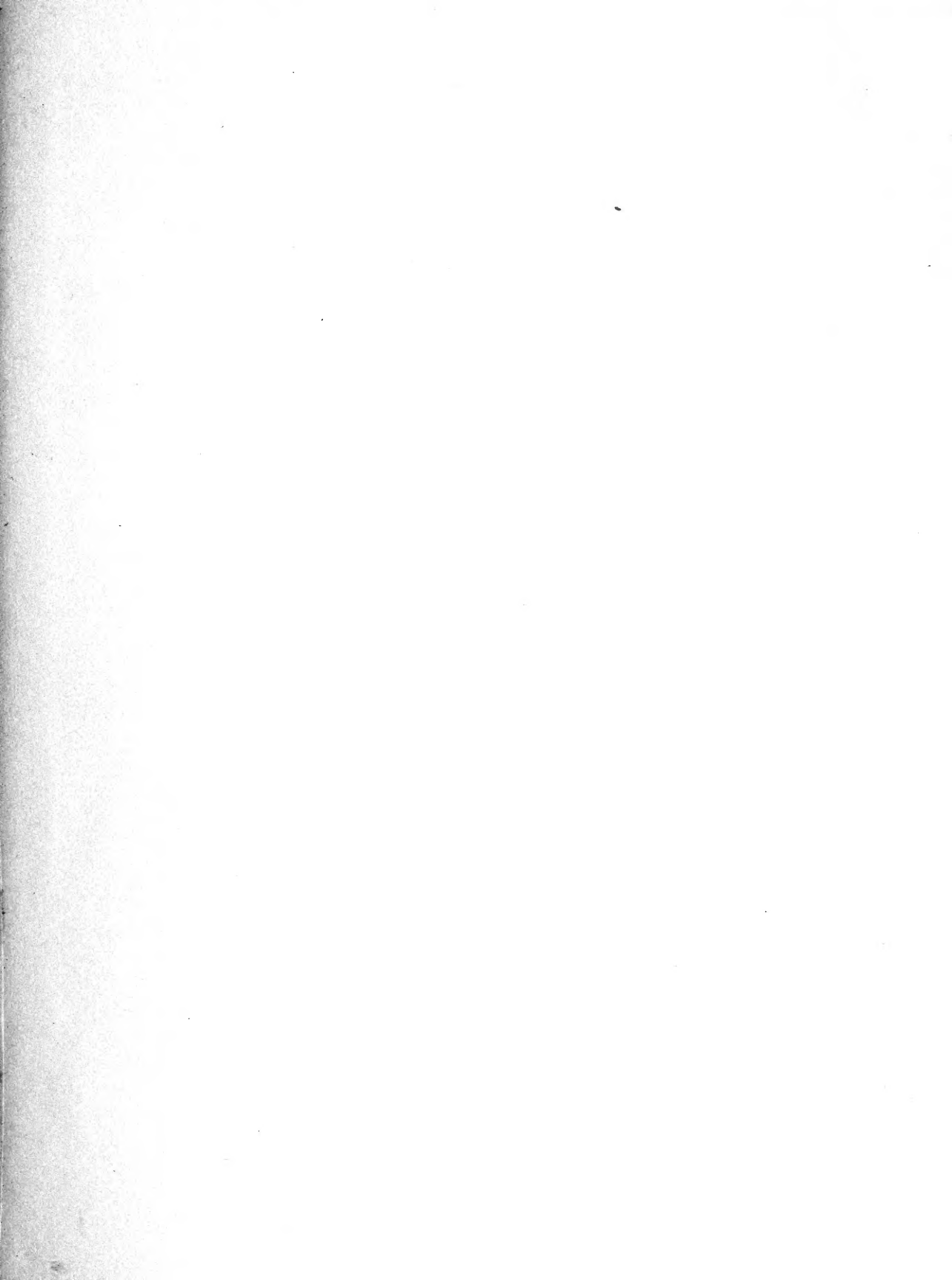
E R R A T A.

In page 2, line 16, insert after *weight*, the words *per acre*.

In page 6, line 21, instead of "*thus for every cow*," say "thus to every cow he gives."

In page 7, for *Keyloe*, read *Kyloe*, and after the words 26 tons, 12 cwt. 3 stones, 2 4-5 lbs. insert *per acre*.

☞ It must be understood, that the steamed *potatoes* and *boiled* chaff, &c. are given to the horses and cows *warm*.



SF
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P75

Priest, St. John

A letter to the members
of the Norfolk Agricultural
Society

Biological
& Medical

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